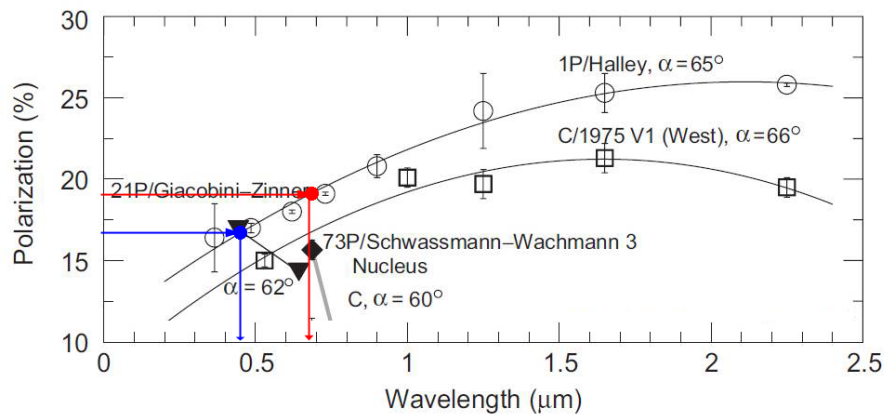


## Imaging polarimetry and spectro-polarimetry of comet C/2013 R1 (Lovejoy)

G. Borisov<sup>1</sup>, S. Bagnulo<sup>2</sup>, P. Nikolov<sup>1</sup>, and T. Bonev<sup>1</sup><sup>1</sup>Institute of Astronomy and National Astronomical Observatory, Bulgarian Academy of Sciences, 72, Tsarigradsko Chaussee Blvd., BG-1784 Sofia, Bulgaria<sup>2</sup>Armagh Observatory, College Hill, Armagh BT61 9DG, Northern Ireland, UK

Comet C/2013 R1 (Lovejoy) was observed during a multi-instrument campaign with the 2-m Ritchey-Chrétien-Coudé (RCC) telescope of the Bulgarian National Astronomical Observatory (BNAO) in Rozhen, during Christmas and New Year's holidays, from 20 Dec 2013 until 07 Jan 2014. Imaging and spectropolarimetric data were obtained on December 28 and January 2, respectively, with the 2-Channel-Focal-Reducer Rozhen (FoReRo2) (Jockers *et al.* 2000) attached at the Cassegrain focus of the telescope. In polarimetric mode, FoReRo2 is equipped with a Wollaston prism placed before a dichroic that splits the signals into two different channels, allowing one to reconstruct polarimetric maps of extended objects in two filters simultaneously. By replacing the filters with two grisms, one can perform spectropolarimetric measurements. All our measurements were obtained using the beam-swapping technique.

Imaging polarimetry was obtained in two dust continuum filters covering wavelength intervals clear from molecular emission and centred at 443 nm and 684 nm, hereafter called BC and RC, respectively. In imaging mode, we measured 17.0% in BC and 18.8% in RC, which is in very good agreement with measurements of other comets at the same phase angle of 64 deg (Mishchenko *et al.* 2010, see the figure for details). We have also obtained polarization maps both in BC and RC. Spectropolarimetry of the nucleus region was found consistent with narrow-band filter polarimetry, i.e., the polarisation increases with wavelength. Molecular emission lines clearly depolarise the continuum. We will compare depolarisation of the molecules with the expected theoretical value of 1/7 from Feofilov (1961).



**Figure:** Spectral dependence of polarization for comets at different phase angles. The curves are polynomial fits. The results for comet C/2013 R1 (Lovejoy) are overplotted in blue and red colour for BC and RC respectively.

**Acknowledgements:** Authors gratefully acknowledge observing grant support from the Institute of Astronomy and Rozhen National Astronomical Observatory, Bulgarian Academy of Sciences. Part of this work was supported by the COST Action MP1104 "Polarization as a tool to study the Solar System and beyond".

**References:** Feofilov, P.: 1961, *The Physical Basis of Polarized Emission* – New York: Consultants Bureau, 1961; Jockers, K., *et al.*: 2000, *Kinematika i Fizika Nebesnykh Tel Supplement* **3**, 13; Mishchenko, M.I., *et al.*: 2010, *Polarimetric remote sensing of Solar System objects* - Kyiv: Akademperiodyka, 2010 ISBN 9789663601342;